The Story of Food Plants

BY

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FIELD MUSEUM OF NATURAL HISTORY
CHICAGO, U. S. A.

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Mexican Market Scene

The Story of Food Plants

PRINCIPAL CENTERS OF ORIGIN OF CULTIVATED PLANTS OF THE WORLD

I. SOUTH WESTERN ASIA
II. SOUTH EASTERN ASIA
III. INDIA BURMA — INDO CHINA REGION
IV. MEDITERRANEAN REGION
V. ABYSSINIA
VI. MOUNTAINOUS REGIONS OF SOUTH AMERICA AND MEXICO

JULIUS MOESSEL

FIELD MUSEUM OF NATURAL HISTORY
DEPARTMENT OF BOTANY
CHICAGO, 1940

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The Story of Food Plants

AS ILLUSTRATED IN FIELD MUSEUM BY A SERIES OF SEVENTEEN MURALS PAINTED BY JULIUS MOESSEL

Primitive man, like other creatures of the forest and field, was once entirely dependent for food on what he could find ready at hand. It is probable that from his earliest beginnings he was as omnivorous as he has remained ever since; though in the course of his progress, as he gained some measure of control over his environment, he has become more exacting in his choice of food. From his progenitors he had inherited a predilection for the honeycombs of bees, a taste for birds' eggs and fledgelings on the nest, and for insects and their grubs under the bark of old stumps. To such succulent items he soon learned to add mussels and fish from tide-pools and streams, and the flesh of such birds and mammals as he could catch readily or kill with sticks and stones. His chief food, however, probably long remained the fruits and roots within easy reach of his prehensile hands.

In the tropics and sub-tropics, if, as seems likely, he originated there, vegetable food of some kind was always obtainable, if not always abundant. But when he gradually spread away from his warm homeland into regions with marked alterations of seasons, he probably found digging for roots in frozen ground little to his liking. Like the squirrels and gophers, whose stores he robbed at every opportunity, he learned in time to make some provision of his own for recurring seasonal scarcity, thereby taking a decidedly progressive step away from the notorious improvidence of his natural kin. Nothing thereafter caused his gray matter greater travail, perhaps, than the problem presented by a lack of available fruits of the earth for winter stores.

Under favorable circumstances, the wild flora of the temperate regions offers a remarkably wide selection of edible, though in many cases not especially palatable, roots and tubers, succulent stalks of herbs, great variety of berries and other fruits, quantities of nuts, and small seeds of grasses. A list of wild plants recommended as substitutes for staple foods was published by the so-called Central Powers during the first World War. It included an astonishing number of species of plants and almost equals the lists that have been compiled of the wild food plants of the North American Indians.

All of such plants are not, of course, found in any one place; and primitive man, though perhaps

Primitive man as a food gatherer, western Asia

wide-ranging, like the American Indian, was dependent on what his particular or temporary locality offered. In the Klamath Lake region of northern California, where square miles of shallow water are covered with the yellow water-lily, the main vegetable food of the Indians today consists of the mucilaginous seeds contained in the lily pods, which are gathered each year and stored to serve winter needs. The neighboring Indians to the south, where the oaks and pinyon pines abound on the hillsides, gather pine seeds and acorns which, crushed and leached in hot water, furnish them their store of vegetable food.

At an early stage of his existence as an intelligent creature, man must have learned that parts of plants may sprout and grow again if placed in the ground. Many Papuans of today remain in the stone age. Taro is one of their staple foods, and the tops of the uprooted tubers are carefully saved, dried, and replanted. Such a replanting furnishes an instance of the simplest form of cultivation. The Papuans clear the forest patch selected for such planting, first by chopping down the smaller trees with a stone axe, then more perfectly by burning. The preserved taro tops are planted in holes made with a heavy pointed stick, the most primitive agricultural implement.

Another important food plant of the Papuans, the banana, must also be propagated by planting parts of its underground stem. The propagation of potatoes and yams involves a similar procedure.

Indians gathering pods of the cow-lily, Klamath Lake, Oregon

In the same manner it must have been discovered that, in many cases, parts of aerial stems planted in the ground will root, continue to grow, and multiply. Sweet potatoes, manioc, and sugar-cane are among the important food plants commonly reproduced by stem cuttings.

It may scarcely be doubted that the Papuan knows very well that seeds set in the ground will produce new plants of their kind, but his taro and banana cultivation involves no such principle. In the Old World millet and in the New World maize were grown from seed in plantations as simple as the Papuan's taro patch and on ground cleared also by burning the forest. The use of fire to clear ground selected for planting seems to have been resorted to everywhere within the tropics where forested ground is considered essential for growing crops, and the practice is still prevalent in many places, even where large scale plantations are contemplated. Where forests exist, the nature and size of the trees furnish a convenient indication of the fertility of the soil and of its suitability for cultivation. It is easier to clear new ground than to fight weeds, especially without efficient agricultural implements. Hence the widespread popularity of what has been termed "devastation agriculture." This practice is responsible for immense damage to the native landscape and often results in almost total extermination of woody plants, so that even firewood is scarce in many areas once well forested.

Papuan planting taro, New Guinea

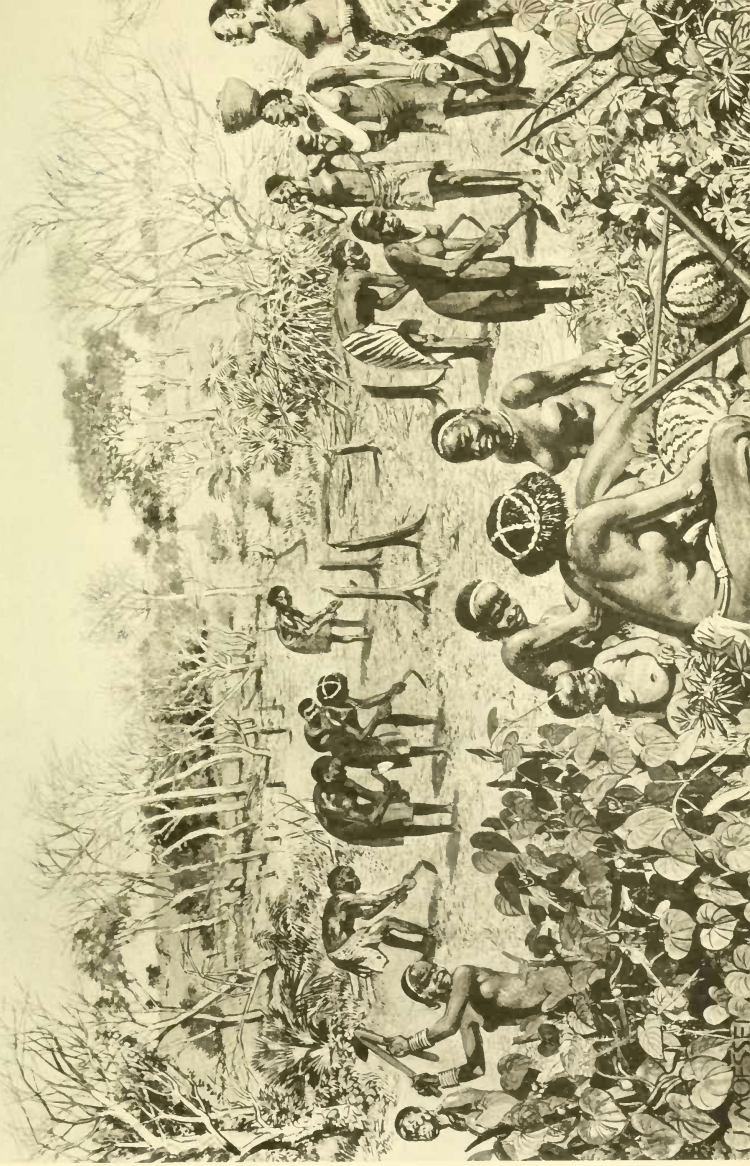
The primitive planting-stick used on all continents became transformed or was replaced in the course of time by a wooden instrument, serving as a hoe or spade, for weeding and digging. With the use of metals, particularly iron, a serviceable hoe came into existence and made possible a more effective preparation of the ground for the planting of food crops. Preliminary clearing and burning of the natural vegetation generally continued to be performed by the men, who also performed the planting, but the subsequent care and harvesting of crops usually became women's work. The use of the hoe as the sole agricultural implement still prevails in many places, though hoes vary greatly in size and shape in different regions. In Africa it is the only agricultural implement for the native planting of millet, sorghum, and other food plants. On the American continent a corresponding instrument made at first entirely of wood, later of wood and copper, formerly served for the cultivation of maize.

With the domestication of the larger mammals and their employment as a source of power, hoe-culture, which on the whole is scarcely more than a form of gardening and is usually performed by women, became in many places of secondary importance and was superseded by agriculture, an occupation for the male. Man's own muscular strength and endurance is, however, insufficient for much of the heavy work required for extensive cultivation of the ground. The use of draft ani-

Indians grinding corn in ancient Mexico

mals, of which the ox was doubtless the first to be employed as an aid in the preparation of the soil, may have originated in the flood-plains of the warmer parts of the Old World, where a simple type of drag or plow served for stirring the surface of alluvial soil along river courses. In Egypt, oxen were used; in southeastern Asia, where lowland rice became the principal cultivated crop, water buffalo furnished the traction. Use of the horse and ass for power is a much more recent practice. There are still places in Africa where hoe-culture persists, side by side with the keeping of cattle that are not used for plowing.

Large areas of the northern continents long remained the home of nomadic tribes constantly in search of new hunting grounds or fresh pastures for their flocks. Before the days of surplus and trade, large and permanent populations and settled conditions of civilization could develop only where a food supply could be produced sufficient and reliable enough to insure freedom from famine. The early civilizations of which there are significant remains in existence grew up in such favored situations as Mesopotamia and the valley of the Nile, where inundations yearly served to fertilize the easily cultivated ground. In most of the temperate regions of the world, production of a stable food supply has been achieved only through the large-scale growing of wheat and other grains, which, with their quick and hundred-fold yield, have become the chief staple food of civilized man.

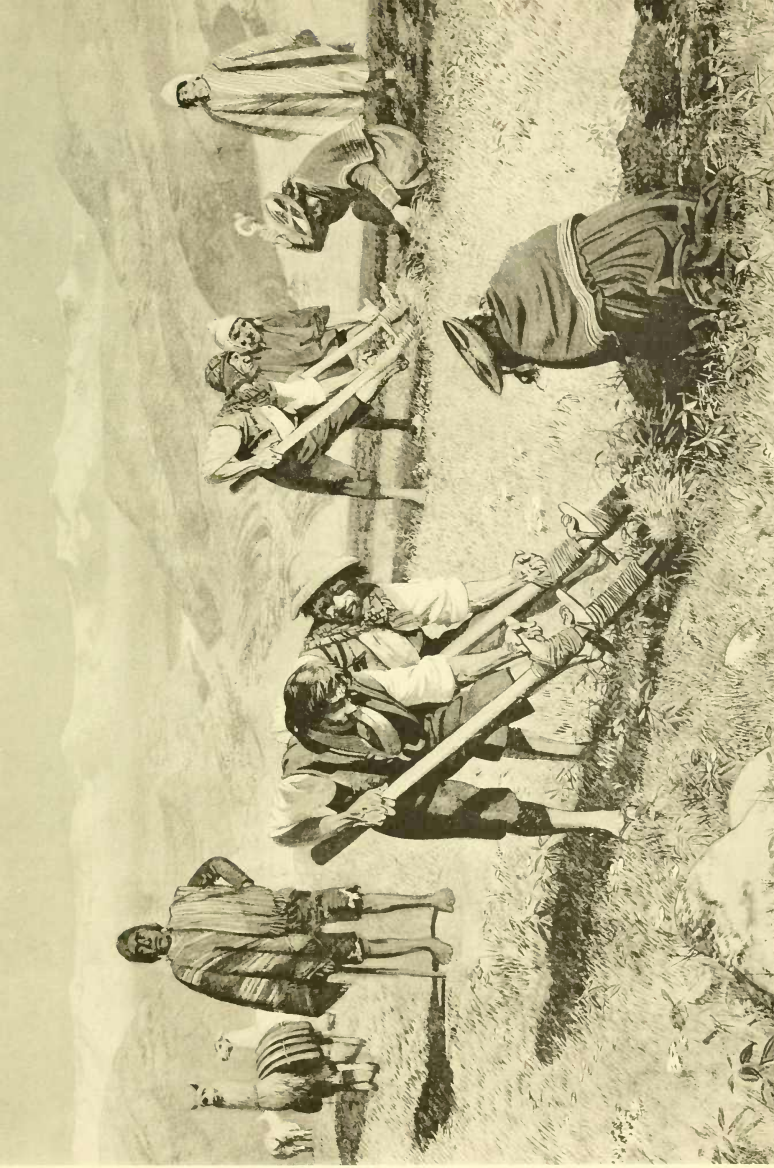


Negro women preparing to plant their crops, southern central Africa

Quantity production of grain requires the preparation of extensive stretches of ground for broadcast sowing. This has become the type of agriculture prevalent over the great grass-covered plains of western Asia, eastern Europe, North America, and Argentina. It became possible only after the domestication of the large and strong mammals and with their employment as a source of power. There was produced in time also an improved plow with a metal cutting edge to break and a moldboard to turn the firmly established and resistant sod formed by the natural vegetation. It has taken mankind a long time to learn that grassland, when properly prepared, is many times more fertile than even the best of burned-over forest soil. In the Old World, millet, several forms of wheat, and other small grains grow wild and were early introduced into cultivation. More than 800,000 square miles of the earth's surface are now plowed for grain production.

The civilizations that developed in America depended on the native maize or corn as the principal food plant. Its cultivation in precolumbian times did not progress beyond a simple form of stick or hoe culture, but had spread from one end of the continent to the other.

The ancient Peruvians terraced and irrigated the ground of their steep slopes much as do the rice-growing farmers of the Philippines and of other Eastern countries. The Peruvians also grew potatoes and other indigenous tubers suitable



Preparing the ground for planting potatoes, Peru

to the high altitude at which they lived. The cultivable land at their disposal is normally covered with a dense natural turf of alpine or subalpine herbs, sedges, and grasses. Considerable effort is required to prepare such ground for planting. Lacking domesticated animals of sufficient strength to be of help in this work, they were obliged to resort to team work on the part of the men. They developed a spade-like instrument, the so-called foot-plow, which served to cut and lift the sod. Two men to dig and a woman on her knees to turn over the loosened sod, constituted a working team. On their communal plantations today, several such groups may be seen working together. After this initial work, the planting, weeding, and harvesting are attended to by the women.

Plants giving sugar in appreciable quantities are less numerous than those which furnish starch. The most important is the sugar-cane. Like rice, it originated in southeastern Asia. It reached Egypt and the Mediterranean by way of Arabia and was brought from India by way of the Madeira and Canary Islands to the New World. There, in the West Indies and in Portuguese colonies of South America, now eastern Brazil, sugar production quickly became a flourishing industry. In Brazil climate, soil, abundance of African slave labor, and European capital and markets combined to make it an immediate success. In islands of the West Indies similar conditions

Rice growing, Philippines

soon brought about an over-production in spite of the enormously increased consumption of sugar. Other sugar-yielding plants that furnish a portion of the world's sugar crop are European sugar-beets and African sorghum.

The most important remaining group of food plants comprises those which yield edible oil. This oil is generally stored in seeds and fruits. Oil thus may be obtained from corn germs, peanuts, from sunflower, rape, and cotton seed, and with great ease and in quantity from the fruits and seeds of various palms, especially the coconut and African oil palm. The oil of the olive has been well known since ancient times and is so generally esteemed above all other edible oils that its source and preparation are of special interest. On the north coast of Africa and among the Aegean Islands there exist certain curious and symmetrically placed stones that long defied interpretation. Recently these were proved beyond doubt to be remains of olive presses of an ancient and primitive type. Olives, first crushed or bruised by a roller, as is done even today, were put in bags and subjected to pressure, obtained in these ancient presses by a stone weight suspended at the end of a lever. A rope and pulley arrangement raised and lowered the weight. In the production of olive oil, the first oil, obtained with least pressure, is clearest and most highly esteemed. The last, as in the extraction of coconut and palm oil, is obtained by boiling the remaining pulp in water.

Plowing and broadcast sowing, United States

Because of early difficulties of communication and transportation, trade with distant countries developed very slowly. But with the gradual establishment of caravan routes between distant points of the far and near East these became highways of commerce for the exchange of the most valued products of each. Aromatics and spices of the Orient began to arrive in the western world, where exotic condiments, such as pepper, nutmegs, ginger, and cinnamon, were prized as much as silks and jewels. More than three thousand years ago this trade extended from China and India to Arabia, Palestine, and Syria. Much of it passed through Babylon, some of it by a more northerly route to the Black Sea. During the time of the Phoenicians, Damascus, Tyre, and Sidon were important centers in a trade that extended also to Egypt and to Carthage and even beyond the Pillars of Hercules. After the fall of the Roman Empire, the trade of the Near East remained for some time largely in the hands of the Persians; later it passed to the Arabs, who supplied the eastern Mediterranean from Egypt to the Euxine.

After the tenth century, the commerce in products of the East was taken over by Italian cities: Naples, Amalfi, Pisa, and especially Venice with its Mediterranean fleet in contact with all Levantine ports. The commercial pre-eminence of Venice came to an end at the close of the fifteenth century with the rapid development of water-borne commerce after

Threshing with flails, Europe

the circumnavigation of Africa and of the world by the venturous mariners of Portugal who initiated an era of geographical discoveries. Merchantmen of other European nations soon embarked on long journeys to strange lands and began to bring the products of far corners of the earth directly to the cities of Western Europe. The slow and costly overland caravan transportation, always exposed to bandit attacks, excessive ransoms, and toll-gate levies, declined; and the center of the world's commerce shifted from eastern Mediterranean to Atlantic ports. The historic visit of French merchants of St. Malo to Yemen, the chief coffee district of Arabia, described by La Roque in his voyage to Arabia Felix, was an event typical of the beginnings of the modern trade by which the special products of distant parts of the world are being made readily available everywhere.

Much as man's dietary has been enriched by world-wide trade, a still more fundamental improvement in it has gradually taken place through the introduction into all continents of the most valuable food plants of other parts of the world. The odor of onions and garlic of western Asia now meets the nostrils of the traveler in all ports. Wheat from western Asia and Abyssinia has long been grown on the plains of eastern Europe. It now covers the broad acres also of North American and Argentine farms. The banana of the oriental tropics is now grown in enormous quantities and in many varieties in all warmer parts of the world.

Colonial sugar plantation in Brazil

There is scarcely a hut between the Tropics of Capricorn and Cancer so remote, or of family so poor, that it can not boast of at least one clump of bananas. Citrus fruits of southeastern Asia are grown on all continents, and the mango tree of India is planted almost everywhere below the frost-line. Rice from southern Asia is produced for export in several of our Gulf States and in various American countries. Sugar-cane of India has become the principal crop of Cuba and other West Indian islands, though African sorghum or European sugar-beets take its place in many districts in Europe and in the United States. The watermelon of Africa has become as thoroughly established and naturalized in North America as have the apples, pears, and peaches of western Asia. The Abyssinian coffee tree transplanted to the New World now furnishes the main revenue crop of more than a half dozen Latin American nations.

Conversely, the African coast has become one of the chief producers of American cacao beans, and Africa has adopted as its principal food plants the corn, peanuts, manioc, and sweet potatoes of the New World. These have in fact become established in Africa to the practical exclusion of original native crops; except for some millets, sorghum, and yams, it is now difficult to conjecture what must have been the staple vegetable food of the Africans before the transatlantic slave trade led to the introduction of American crop plants in the black man's continent.

A primitive olive press, northern Africa

Far-off Java has become the exporter of tapioca, prepared from starch of the South American manioc (mandioca or cassava); India is the purveyor of cashew nuts. Maize, unquestionably the foremost food plant of American origin, has become important in other parts of the world, as for example in the Balkan countries.

The greatest contribution to the white man's food supply was made when, after the discovery of America, the potato in use among the Indians of southern Chile was transported across the sea and planted in France and Germany, "ending forever the danger of European famine." It finally returned to America and reached the United States by way of the British Isles. After wheat, it is now our most indispensable vegetable food. The present North American consumption of potatoes is estimated at almost a million bushels a day, the world production at more than four billion bushels annually. It has been pointed out that a single year's production of this crop alone is worth immensely more than all the gold obtained by Spain through its conquest of Mexico and Peru.

Other edible tubers of the Andean region are cultivated locally, but because they are grown only at high altitudes have never come into general use. Peppers, tomatoes, lima and kidney beans, squash, and pumpkin are other well known American contributions to the world's food supply.

The origin of a large proportion of our food plants and the place and time of their first cultiva-

Caravan north of the Persian Gulf

tion is difficult or impossible to determine with certainty. Written records pertain only to historic time. It is, however, certain that the history of cultivated plants does not begin with Egypt or Mesopotamia. Archaeological remains may yield in time further information but in the end are likely to remain inadequate. In spite of recent significant discoveries of ancient human remains in Europe, in Africa, and in Asia, the history of early man remains largely a matter of inference and speculation. Botanical evidence, however, is increasing. Of many cultivated food plants the wild forms are well known; of others there are known only related wild forms that can not be said to be ancestral, and the original wild forms of some of these have apparently disappeared or are still undiscovered or unrecognized.

Botanical explorations in Asia have revealed various subtropical regions in which many of the cultivated plants of the Old World exist in great abundance and variety. In other large regions, very few cultivated forms are to be found. In the absence of any precise knowledge of changes in the distribution of plants resulting from alterations in climate since the first appearance of man on the earth, it seems entirely reasonable to assume that the origin and place of the original cultivation of crop and food plants are to be found in areas where they or their nearest relatives still grow spontaneously, most abundantly, and in their greatest variety.

Early French coffee buyers in Arabia

On this basis, the Russian agro-botanist, N. I. Vavilov, famous for his inquiries into this question, comes to the conclusion that the cultivation of most of the important food plants of temperate regions originated in mountain or foot-hill zones adjacent to the extensions of the Himalayas and other mountains of Asia, the mountains of Abyssinia in Africa, and the Andes of South America. He lists six principal centers as shown on an adjoining map. Five of these are in the Old World, one in the New. They are as follows:

(1) Southwestern Asia, the most important Old World center of cultivated plants, including soft and club wheat, rye, also broad beans, peas, and lentils, carrots and turnips, apples, pears, quinces, plums, sweet cherries, almonds, and pomegranates; (2) southeastern Asia, including the mountains of eastern China, which has given rise to forms of oats and barley, soy beans, millet, various cultivated vegetables, and citrus fruits; (3) northeastern India, Indo-China, and Burma, the home of sugar-cane and rice; (4) northern Africa, especially Abyssinia, with numerous forms of durum wheats, oats, barley, millet, and peas; (5) the Mediterranean region, with figs and olives; and finally (6) the Andean region of South America to southern Mexico, with important early centers of cultivation of maize, potatoes, peppers, tomatoes, lima beans, etc.

These principal areas enumerated by Vavilov are chiefly mountainous regions in which are now

A wholesale vegetable market

concentrated almost half of the population of the world. They account for the probable geographical origin of all the most important cultivated food plants. Of the remainder, he considers some regions, such as the Philippines, the Kaffir corn region of Africa, and perhaps one or two others, as possibly important enough to be considered geographical centers of lesser rank.

In all of these places some form of cultivation doubtless originated independently in the distant past. How distant can only be conjectured as long as geological and anthropological time scales differ widely. The botanical evidence indicates that the cultivation of food plants, if not actually as old as man, is at least vastly more ancient than was formerly supposed.

Open air market in southern Mexico

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ARCTIC CIRCLE
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TRADE ROUTES
OF THE WORLD
EUROPE
ASIA
AFRICA
ATLANTIC OCEAN
PACIFIC OCEAN
INDIAN OCEAN
VENICE
GENOA
MARSEILLE
BARCELONA
CORDOVA
MOROCCO
ALEXANDRIA
BYZANTIUM
BOKHARA
SAMARKAND
TURFAN
HAMI
YARKAND
MERV
TEHRAN
PERSIA
BAGHDAD
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TYRE
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